The

Large Volume Leak Study

Brief Summary of
Research Methods and Findings

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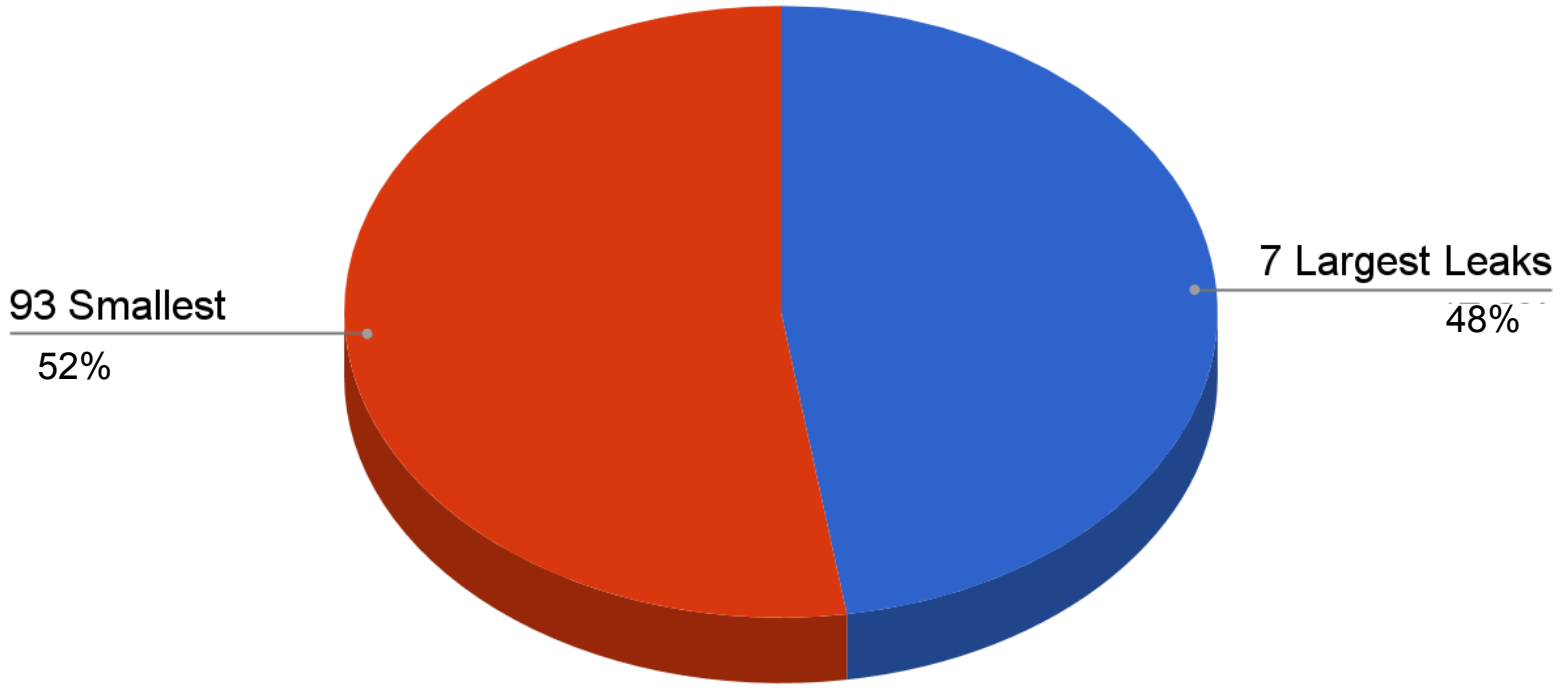
Barr Foundation

2016: Hendrick et al. “Super-emitter” study found 7% of leaks emit almost half the gas

Emissions of 100 leaks in Boston area
(cast iron, primarily low pressure)



Hendrick MF, Ackley R, Sanaie-Movahed B, Tang X, Phillips NG, Fugitive Methane Emissions from Leak-prone Natural Gas Distribution Infrastructure in Urban Environments. Environ Pollut. 2016 Jun;213:710-716. doi: 10.1016/j.envpol.2016.01.094. Epub 2016 Mar 26.

Hendrick's study used the chamber method:

Scientifically verified but laborious

2016: Law Passed

Utilities need identification method.

Chamber method too slow for 16,000 leaks.

50% or higher barhole method suggested.

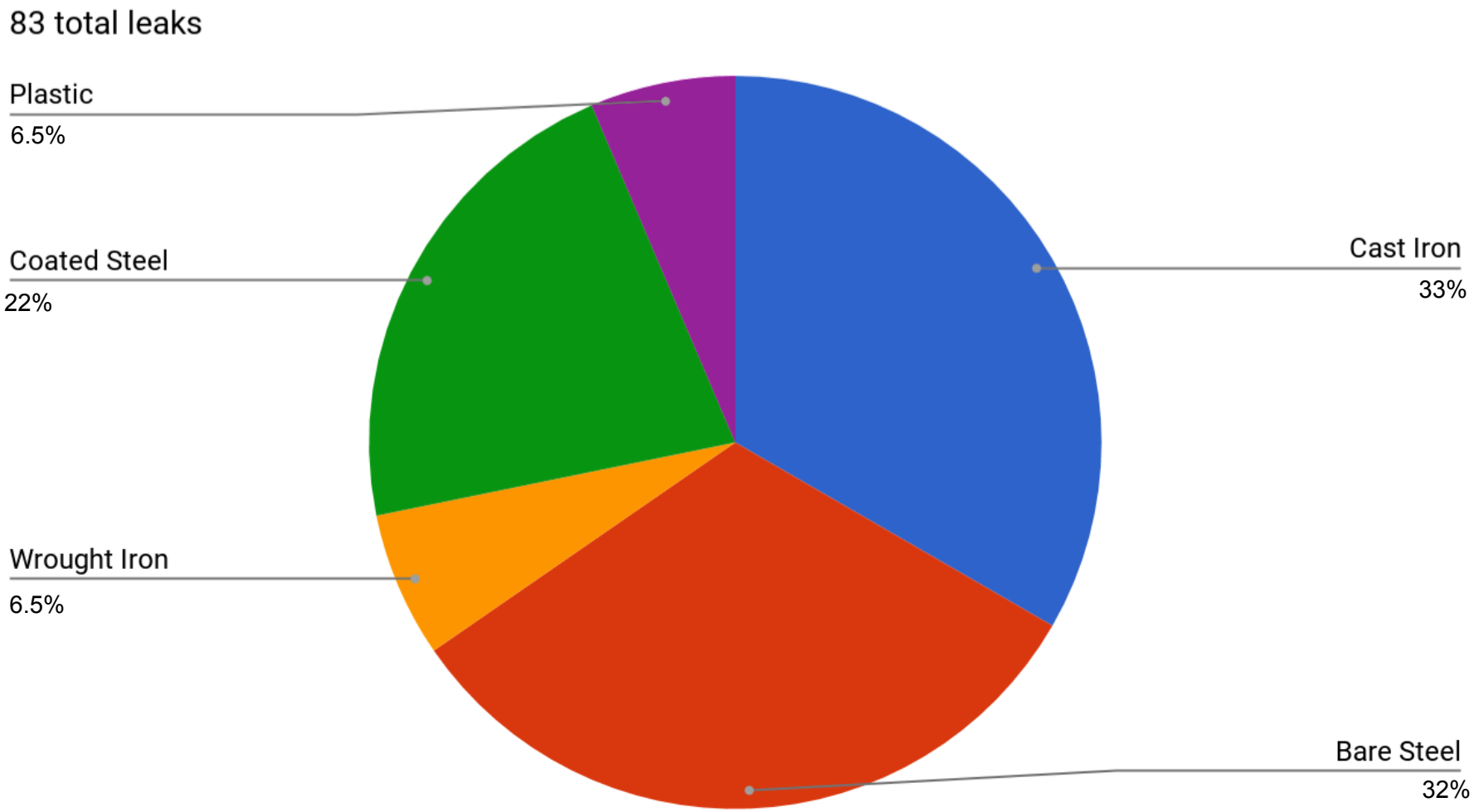
2017: The Large Volume Leak (LVL) Study

- **Goal:** Find a scalable, reliable proxy method to identify LVLs so utilities can prioritize them.

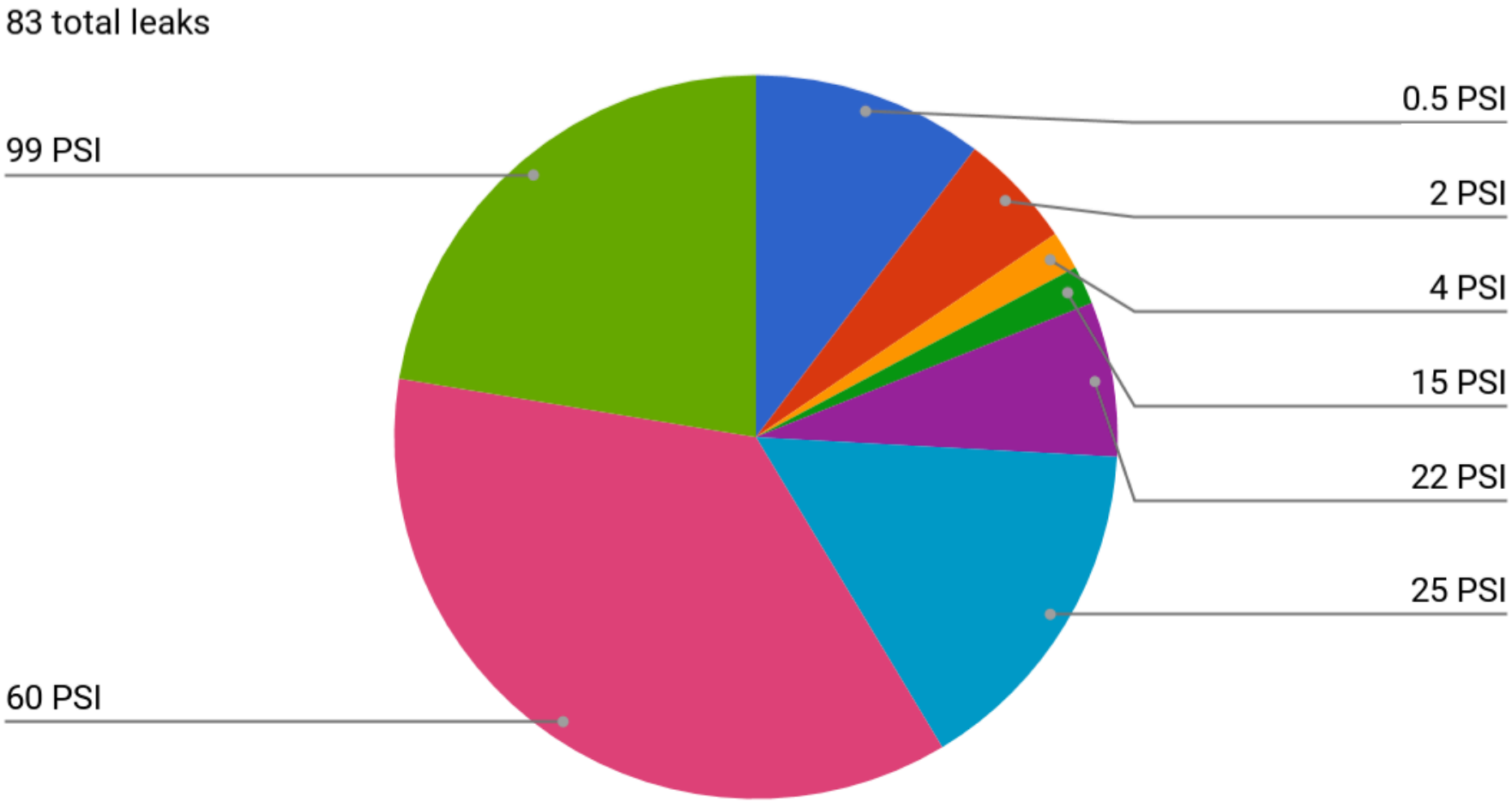
- **Participating Utilities:**
  National Grid, Eversource & Columbia Gas

- **Leaks Studied:**
  - 69 leaks selected for barhole-read
  - 14 selected by Picarro

All Leaks in Study by Pipe Material



All Leaks in Study by Pipe Pressure



Research Methods

1. Surveyed the leaks
   a. Normal Leak Survey

Research Methods

1. Surveyed the leaks.
    a. Normal Leak Survey
    b. Picarro Survey

(using Boston University's GPS-enabled Cavity Ringdown Spectrometer)

Research Methods

1. Surveyed the leaks
    a. Normal Leak Survey
    b. Picarro Survey
2. Measured the leaks multiple ways
    a. Chamber Method

Research Methods

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    a. Normal Leak Survey
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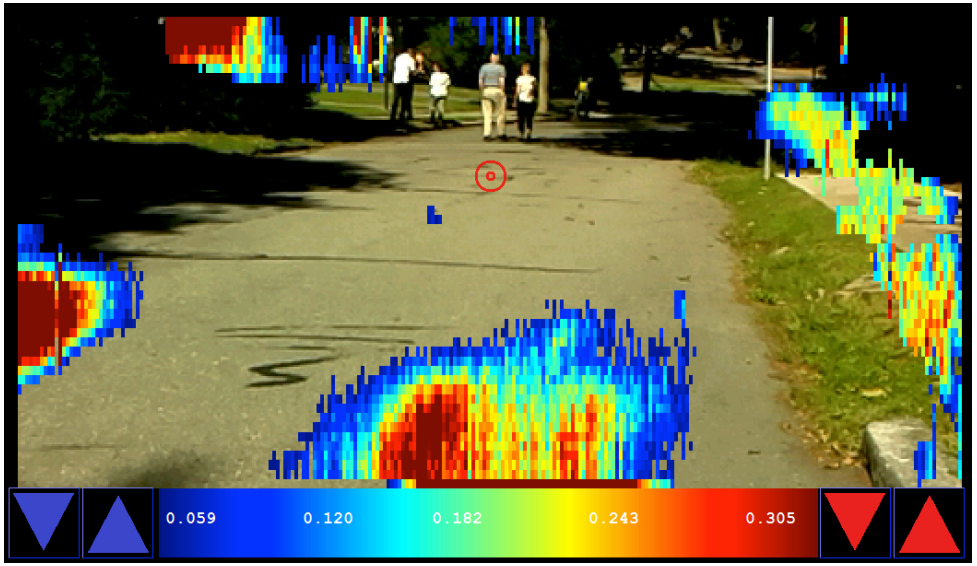
2. Measured the leaks multiple ways
    a. Chamber Method
    b. MSS camera

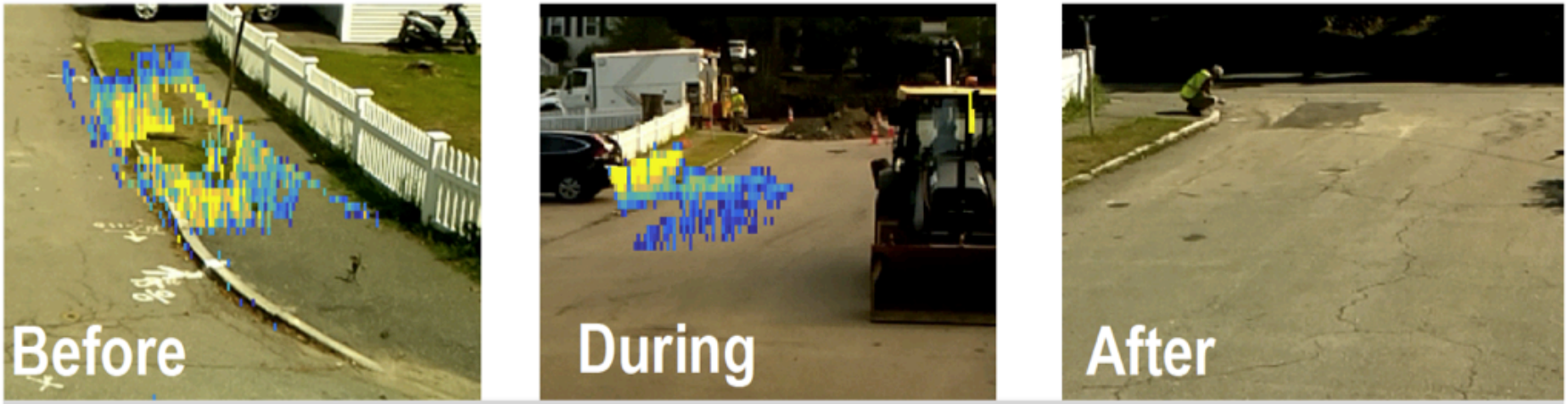


Research Methods

1. Surveyed the leaks
    a. Normal Leak Survey
    b. Picarro Survey
2. Measured the leaks multiple ways
    a. Chamber Method
    b. MSS camera
    c. FLUXbar

Background Info on Innovative Technology:

MultiSpectral Imaging Camera by Multisensor Scientific (MSS)



Documentation of Leak Repair Success (Proof-of-Concept Results)

Provides real time detection and visualization of methane gas using absorption spectroscopy technology and sunlight.

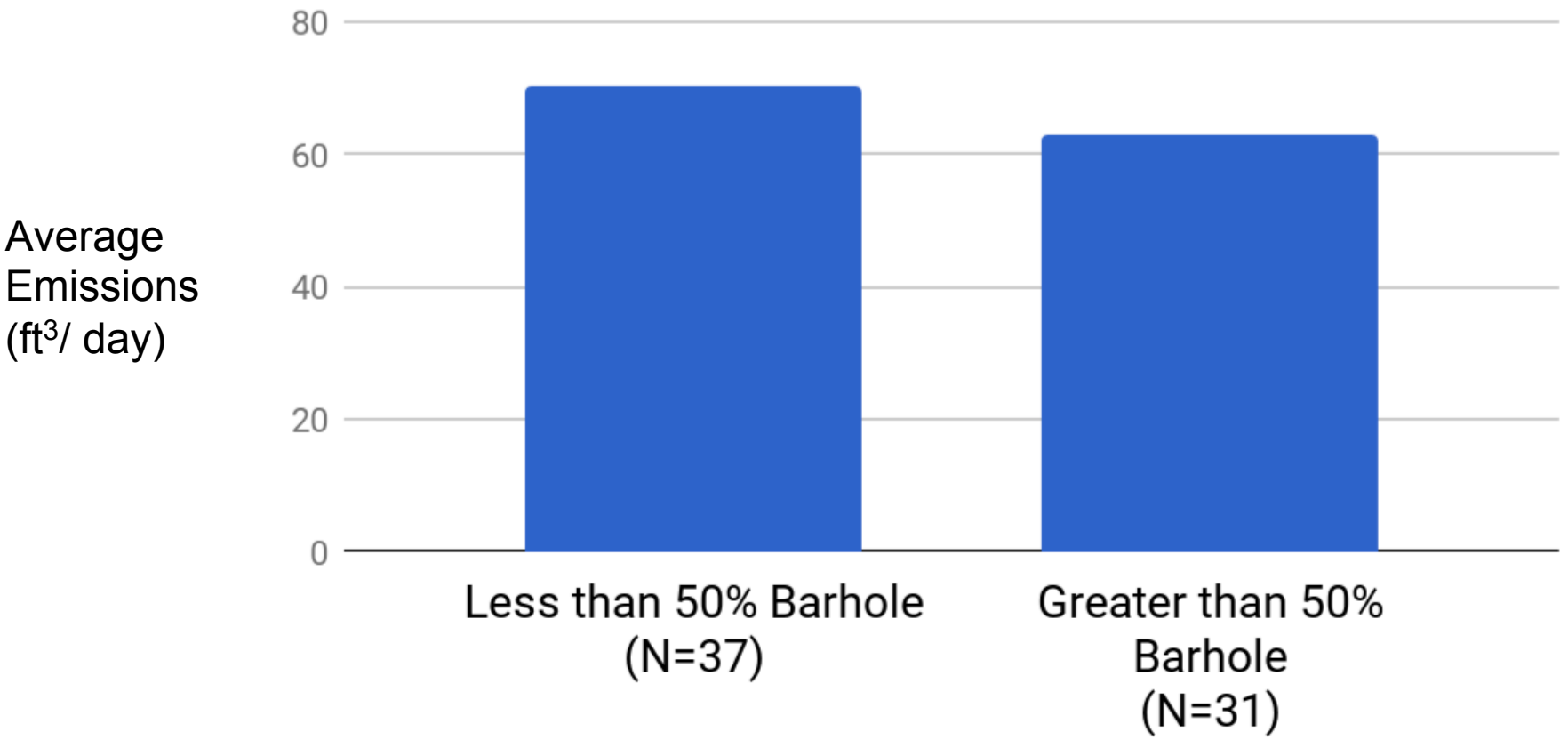
Background Info on Innovative Technology:

FLUXBar - created for the study by Millibar, Inc.

1. Inserted into hole drilled directly over leak.
2. Sucks air from under street at constant rate (3CFM).
3. Measures percent of gas in airflow.
4. Drains residual gas away until percent of gas plateaus.
5. This measure is a good proxy for the flux of a leak.

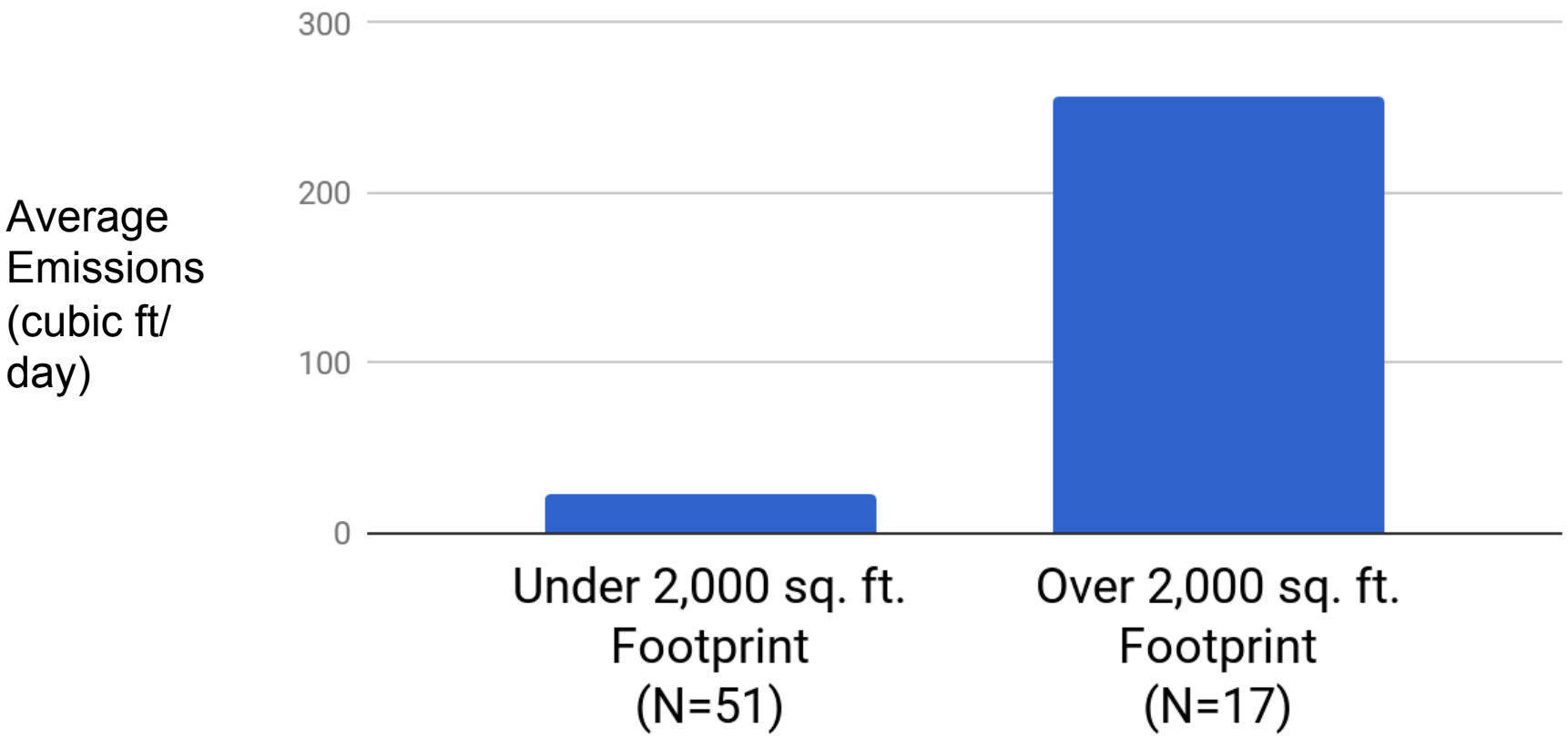
Research Key Findings:

Barhole reads are **NOT** correlated with emissions



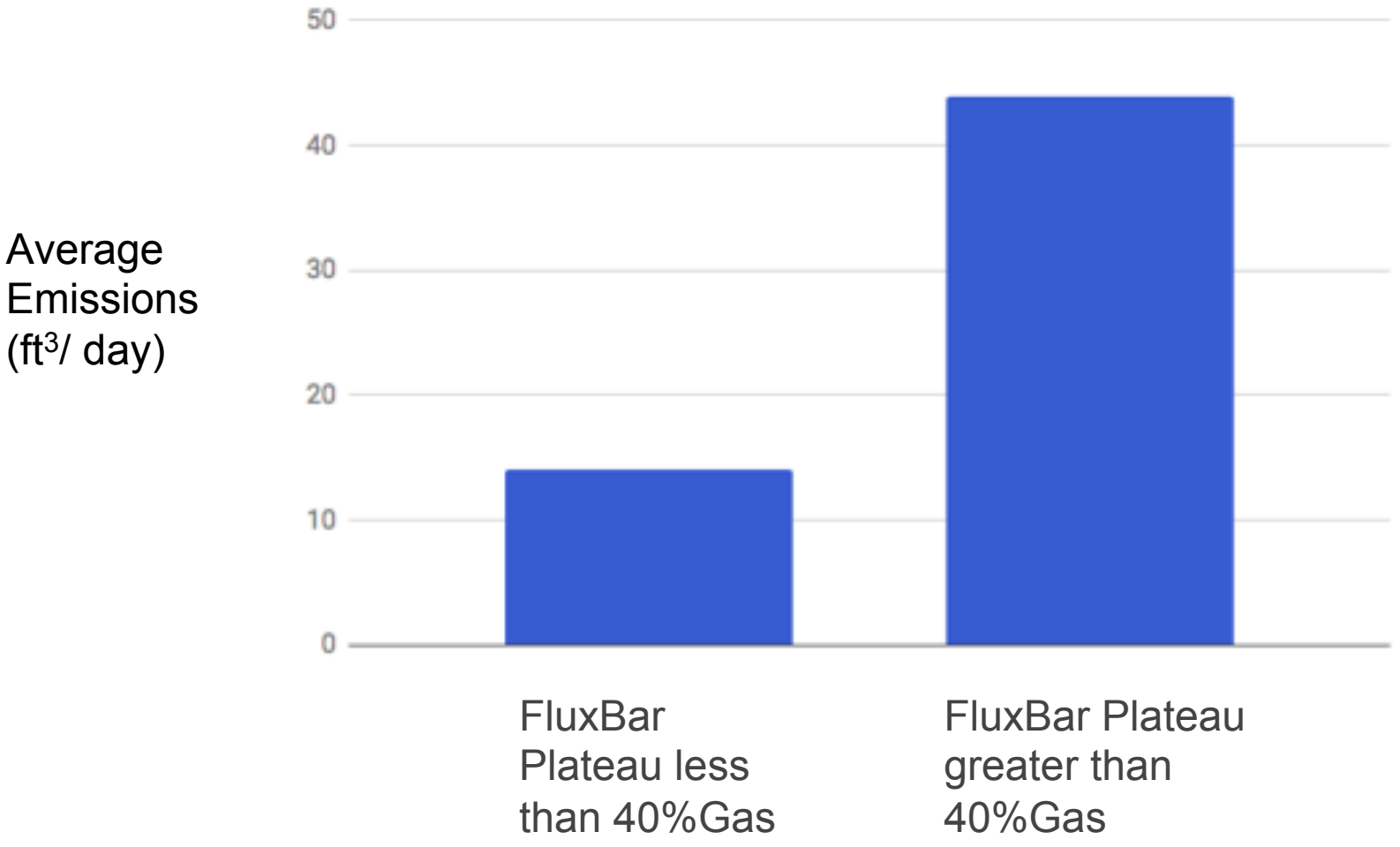
Research Key Findings:

Leak footprint **IS** correlated with emissions



Research Key Findings:

FLUXBar **IS** correlated with emissions



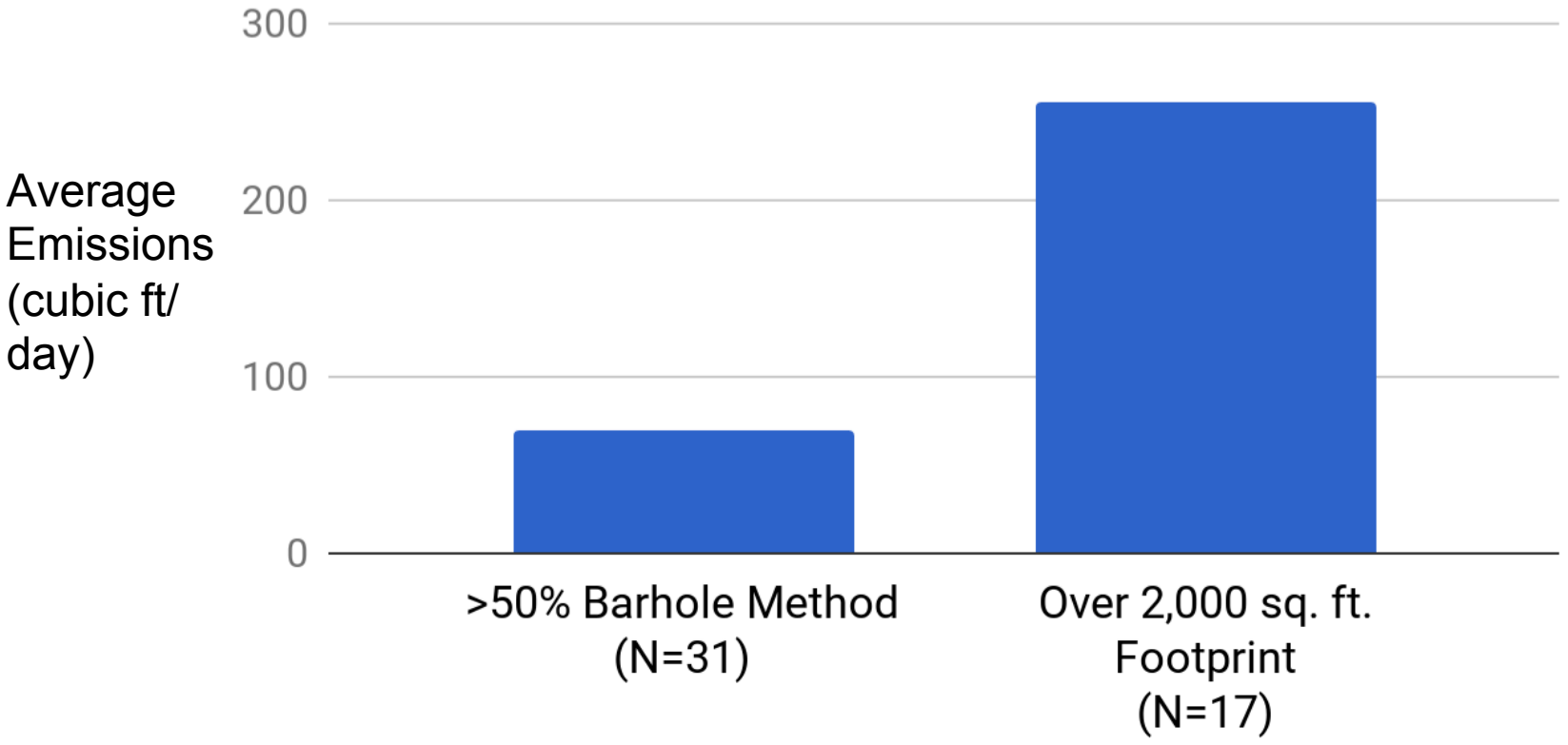
Practical Note:

FLUXBar use requires a compressor truck.

Therefore not cost-effective to use during leak survey.

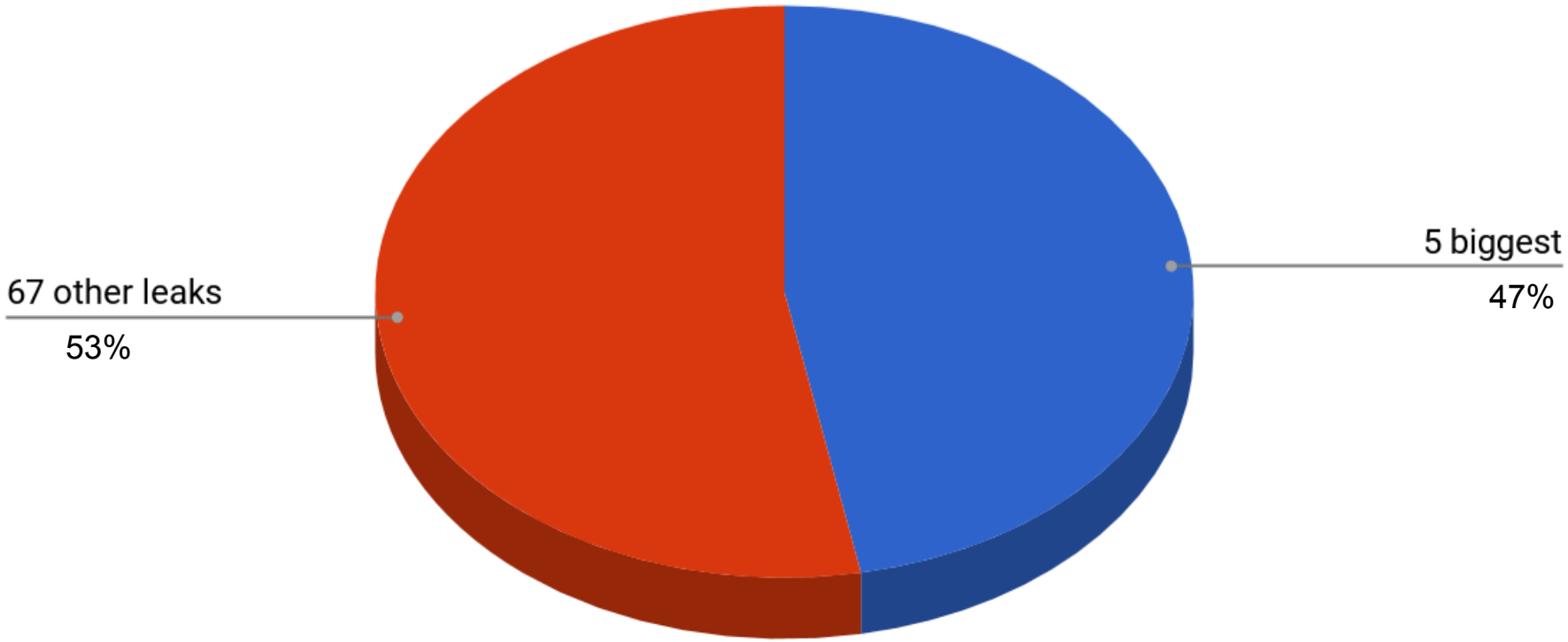
Research Key Findings:

Comparison of LVL ID by barhole and by footprint:



Research Key Findings:

LVL Study Duplicated Hendrick et al. 2016 Results
(even with varied pipe pressures & materials)



CONCLUSION: Path to cut emissions in half

1. Initial ID of LVLs during survey using
   - Leak Footprint > 2,000 ft^2
2. Verify LVLs & improve data by using
   - FLUXBar during leak repair
3. Repair the leaks
4. Report results publicly to DPU
5. Reassess annually